



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/607,604	06/30/2000	Robert C. Allison	PD-00W014	8542

7590 05/22/2002

Leonard A. Alkov, Esq.
Raytheon Company
E1/E150
P.O. Box 902
EI Segundo, CA 90245-0902

EXAMINER

CATHEY, DAMIAN E

ART UNIT	PAPER NUMBER
----------	--------------

2817

DATE MAILED: 05/22/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/607,604

Applicant(s)

ALLISON ET AL.

Examiner

Damian E. Cathey

Art Unit

2817

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 5,9,13,14,21 and 25-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) _____ is/are rejected.
- 7) ☒ Claim(s) 13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 June 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Claim Objections

Claim 13 is objected to because of the following informalities: Claim 13 depends from canceled claim 12. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 5, ~~25~~, and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by Loo et al. U.S. Patent No. 5,757,319.

Referring to claim 5, Loo et al. disclose (Fig. 1) a phased array antenna (See Loo et al. – abstract) including single pole single throw switches, 120a-c, 122a-c, 124a-c, and 126a-c.

Referring to claim 25, Loo et al. disclose (Fig. 1) an electronically scanned array including a linear array of radiating elements, 60A-E (See Loo et al. Col. 2, line 28), and an array of phase shifters, 100A-E (See Loo et al. Col. 2, line 40), coupled to the

radiating elements, 60A-E, and an RF manifold including a plurality of phase shifter ports (See Loo et al. Fig. 2), respectively coupled to a corresponding phase shifter RF port, and a beam steering controller, 80 (See Loo et al. – abstract). Loo et al. further disclose that the phase shifters each include a plurality of MEM switches (See Loo et al. Fig. 1) responsive to control signals to select a number of phase shift settings (See Loo et al. Col. 1, line 47) for the phase shifter, and the phase shifters including switched line phase shifters (See Loo et al. Fig. 2) including a reference signal path (through switches 120A, 122A, 124A, and 126A) and phase shift paths 110, 112, 114, and 116, each having an electrical length selected to provide a phase shift value at an operating wavelength, and wherein the MEM switches, 120a-c, 122a-c, 124a-c, and 126a-c, are configured to select either the reference path (through switches 120A, 122A, 124A, and 126A) or a phase shift path 110, 112, 114, and 116, and wherein one MEM switch, 120A, 122A, 124A, or 126A, selects the reference path.

Referring to claim 26, Loo et al. disclose (Fig. 2) a reference signal path through switches 120A, 122A, 124A, and 126A.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

Art Unit: 2817

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims ~~9~~, 13, 14, ~~30~~, and ~~32~~, are rejected under 35 U.S.C. 103(a) as being unpatentable over Loo et al. U.S. Patent No. 5,757,319 in view of Hong U.S. Patent No. 6,281,838.

In reference to claims 30 and 32, Loo et al. disclose (Fig. 2) an RF phase shifter having first and second ports, and a MEM switching circuit having a plurality of single-pole-single-throw metal-metal contact RF MEMs series switches responsive to control signals, in order to select a desired phase shift value. Loo et al. further disclose (Fig. 2) the circuit to be a switched-line phase shifter including a reference path (through switches 120A, 122A, 124A, and 126A), and a phase shift path.

Claim 30 states that the circuits are connected to provide a single-pole-multiple-throw or multiple-pole-multiple-throw function, which is not stated by Loo et al.

Hong discloses (Fig. 3) a base-3 switched line phase shifter using micro electromechanical MEMS technology. Hong further discloses (Fig. 2) a prior art, 2-base

phase shifter having six serially connected stages, 22a-f, with two delay lines, 24a and 24b per stage. Hong further discloses that a superior method is achieved by using base-3 rather than base-2 selection of delay lines (See Hong Col. 2, line 36 and line 44). Hong states that using the same number of switches, the number of stages can be reduced, wherein the base-3 implementation, using multiple-pole-multiple-throw switches, having 12 delay lines uses four stages, while the base-2 implementation uses six stages (base-2 uses 24 switches to account for six stages whereas base-3 uses 24 switches to account for 4 stages), thus the base-3 implementation significantly reduces the loss and distortion experienced by the transmission signal, because of a reduction of stages (See Hong Col. 2, lines 44-54).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have further modified the phase shifter of Loo et al. to be a 3-base phase shifter rather than a 2-base phase shifter by substituting the phase shift switches (120b and 120c, 122b and 122c, 124b and 124c, and 126b and 126c) that are single-pole-single-throw switches with the double-pole-double-throw switches of Hong.

The above substitution would have been recognized as advantageous benefit of reducing the number of phase shift stages, and therefore, significantly reducing loss and distortion, as taught by Hong.

In reference to claim 13, the substitution above provides multiple-pole-multiple-throw switching.

Referring to claim 14, Loo et al. disclose metal-metal contact RF MEMs series switches.

In reference to claim 9, Loo et al. disclose (Fig. 2) that a single MEM switch, 120a, 122a, 124a, or 126a) provides the reference signal path.

Claims 21, 27, 28, 29, 31, and 33, are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakahara U.S. Patent No. 5,379,007 in view of Loo et al. U.S. Patent No. 5,757,319 and Hong U.S. Patent No. 6,281,838.

Referring to claims 27, 31, and 33 Nakahara discloses (Fig. 7) a phase shifter device, 700, wherein each of the reflection phase shifters, 100 and 300, comprise a coupler device, 3, having first and second RF I/O ports, and in phase quadrature ports, and first and second reactance circuits, 4a/6a/7a/9, 4b/6b/7b/9 respectively coupled to the in-phase and quadrature ports by first and second FET switch circuits, and 7a/4a, and 7b/4b. Nakahara further discloses that each resonant circuit comprises an FET, 7a and 7b, and an inductor, 9, connected between source and drain electrodes of the FETs, 7a and 7b. As a result, three different phase shift values are attained in one reflection phase shifter resulting in a two bit phase shifter smaller than the conventional two bit phase shifter in which two reflection phase shifters are connected in series.

Claim 27 states that the phase shifter includes first and second MEM switch circuits, which is not stated by Nakahara.

Loo et al. disclose (Fig. 2) a scanned array including a linear array of radiating elements, 60A-E (See Loo et al. Col. 2, line 28), and an array of phase shifters, 100A-E (See Loo et al. Col. 2, line 40), coupled to the radiating elements, 60A-E, and an RF

manifold including a plurality of phase shifter ports (See Loo et al. Fig. 2), respectively coupled to a corresponding phase shifter RF port, and a beam steering controller, 80 (See Loo et al. – abstract). Loo et al. further disclose that the phase shifters each include a plurality of MEM switches (See Loo et al. Fig. 1) responsive to control signals to select a number of phase shift settings (See Loo et al. Col. 1, line 47) for the phase shifter.

Hong discloses (Fig. 3) a base-3 switched line phase shifter using micro electromechanical MEMS technology, and that various types of MEM phase shifters have been developed including, switched-line, reflection, and loaded-line phase shifters (See Hong Col. 1, line 48), that the switching means for selecting a desired phase shift is controlled by a microprocessor over electrical control lines with either parallel or series access to the switches (See Hong Col. 2, line 21), and that PIN diode switches or FET switches can be implemented in the phased array.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have substituted the FET switches, 7a and 7b of the reflection phase shifter of Nakahara with a parallel connection of MEM switches as taught by Loo et al. and Hong.

The above substitution would have been obvious because it would have been considered both a substitution of art-recognized equivalent switches in view of recognition that FETs, MEM switches and PIN diodes are interchangeable, and an advantageous means of attaining two different phase shift values in one reflection

phase shifter resulting in a two bit phase shifter smaller than the conventional two bit phase shifter in which two reflection phase shifters are connected in series.

Referring to claim 21, the modification and substitution described in claims 9, 14, and 30 allows for the first and second MEM switches to provide multiple-pole-multiple-throw functions.

In reference to claim 28, Loo et al. disclose (Fig. 2) a base-2 phase shifter, but the modification above would change the base-2 phase shifter to a base-3 phase shifter, wherein the first and second MEM switch circuits, 110 and 112, would have first, second, and third MEM switches, each terminated in a first, second, or third plurality of susceptances.

Referring to claim 29, Hong discloses that it is possible to realize series or parallel switching (See Hong Col. 2, line 19), and Nakahara discloses (Fig. 1) a reflection circuit, 100, having two phase shift quantities, a phase shift circuit (Fig. 7) having three phase shift quantities (See Nakahara Col. 9, line 15), and a phase shift circuit (Fig. 10), 1000, having four different phase shift circuits (See Nakahara Col. 10, line 52). Nakahara further discloses as many reflection phase shifters as desired phase shift quantities must be connected in series (See Nakahara Col. 4, line 16). Any amount of phase shift quantities can be obtained.

Response to Arguments

Applicants arguments filed February 2, 2002 have been fully considered but they are not persuasive. Applicants argue that neither Hong nor Nakahara disclose or suggest a reflective phase shift circuit having first and second reactance circuits. In response, Nakahara discloses a reflective phase shift circuit having first and second reactance circuits formed by an FET and a transmission line in Fig. 1 (see elements 6A,6B).

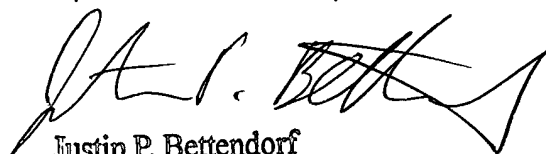
Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Damian E. Cathey whose telephone number is 703-305-1631. The examiner can normally be reached on 7:00 - 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bob Pascal can be reached on 703-308-4909. The fax phone numbers for the organization where this application or proceeding is assigned are 703-746-7266 for regular communications and 703-305-0142 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



Justin P. Bettendorf
Primary Examiner
Art Unit 2817